

## STUDIES IN THE UMBELLIFERAE. I<sup>1</sup>

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A critical study of the genus *Cymopterus* has necessitated a detailed investigation of about twenty allied genera including *Glehnia* Schmidt.

Asa Gray in 1859 doubtfully referred a plant from the Cooper collection in the region of Puget Sound, Washington, to the genus *Cymopterus*, and in 1860 published the species as *Cymopterus* ? *littoralis*. Bentham ('67) in Bentham and Hooker's 'Genera Plantarum,' published in September, 1867, transferred this species to his new genus *Phellopterus*. F. Schmidt ('67), some time between January and July inclusive of the year 1867, in his 'Prolusio Florae Japonicae' published the new genus *Glehnia*<sup>2</sup> with one species, *G. littoralis*, basing it on a Maximowicz plant from Hakodate. In this work Schmidt also included *Cymopterus* ? *littoralis* Gray as a distinct species. In 1868 in his 'Flora Sachalinensis' he recognized that his *Glehnia littoralis* was conspecific with *Cymopterus* ? *littoralis* Gray and adopted the generic name *Phellopterus* of Bentham. Upon critical examination of the Cooper and Maximowicz types Schmidt's view as to the congeneric nature of the two is confirmed. As the generic name *Glehnia* of Schmidt was published at least two months prior to the *Phellopterus* of Bentham, on the basis of priority, it must be retained as the correct name for the genus and the Maximowicz plant must be taken as the generic type. The historical type of the genus is then the plant collected by Maximowicz in Hakodate, Japan, in 1861 and must bear the specific name *Glehnia littoralis* Schmidt.

Bentham, G. ('67)). In Bentham, G., and J. D. Hooker, *Genera Plantarum* 1: 905. September, 1867.

Gray, Asa ('59). "Botany of Japan." *Mem. Am. Acad. N.S.* 6<sup>2</sup>: 391, 428. 1859.  
———, ('60). *Stevens' Report of U.S. Explorations & Surveys from the Mississippi River to the Pacific Ocean* 12<sup>2</sup>: 62. 1860.

<sup>1</sup> Issued April 30, 1928.

<sup>2</sup> The genus *Glehnia* was so named in honor of Peter von Glehn who collected with Schmidt on the Island of Sachalin.



- Schmidt, F. ('67). *Prolusio Florae Japonicae* in Miq. Ann. Mus. Bot. Lugd. Bat. 3: 61. January-July, 1867; *Prolusio Florae Japonicae*, 249. 1867.  
 ———, ('68). *Flora Sachalinensis*. Mem. Acad. Imp. Sci. St. Petersbourg, VII, 12<sup>2</sup>: 138-140. 1868.

**Glehnia** Schmidt, Prol. Fl. Jap. in Miq. Ann. Mus. Bot. Lugd. Bat. 3: 61. Jan.-July, 1867; Prol. Fl. Jap. 249. 1867; Baillon, Hist. Plant. 7: 215. 1880; Coult. & Rose, Contr. U. S. Nat. Herb. 7: 165. 1900; Piper, Contr. U. S. Nat. Herb. 11: 429. 1906; Henry, Fl. S. Brit. Col. 223. 1915; Piper & Beattie, Fl. N. W. Coast, 267. 1915; Carter & Newcombe, Prel. Cat. Fl. Vanc. 61. 1921.

*Phellopterus* Benth. in Benth. & Hook. Gen. Pl. 1: 905. September, 1867, not *Phellopterus* Nutt. (section under *Cymopterus* in Torr. & Gray, Fl. N. Am. 1: 623. 1840) in Coult. & Rose, Contr. U. S. Nat. Herb. 7: 166. 1900; Schmidt, Mem. Acad. Imp. Sci. St. Petersbourg, VII, 12<sup>2</sup>: 138. 1868; Franchet & Savatier, Enum. Plant. Jap. 1: 185. 1875; Wats. Bibl. Ind. 1: 430. 1878; Franchet, Cat. Plantes, in Mem. Soc. Nat. Sci. Cherbourg 24: 221. 1884; Coult. & Rose, Rev. N. Am. Umbell. 21, 81. 1888; Macoun, Check List Can. Plants, 25. 1889; Cat. Can. Plants 5: 329. 1890; Howell, Fl. N. W. Am. 1: 259. 1898; Engl. & Prantl, Nat. Pflanzenfam. 3<sup>8</sup>: 221. 1898; Ito & Matsumura, Tent. Fl. Lutch. in Jour. Coll. Sci. Imp. Univ. Tokyo 12: 529. 1899; Yabe, Rev. Umb. Jap. in *Ibid.* 16<sup>2</sup>: 92. 1902; Boiss. Omb. Cor. in Bull. Herb. Boiss. II, 3: 955. 1903; Nakai, Fl. Kor. 1 in Jour. Coll. Sci. Imp. Univ. Tokyo 26<sup>1</sup>: 272. 1909.

Herbaceous, subacaulescent, glabrous or pubescent perennials. Leaves coriaceous, petioled, bipinnatisect, broadly ovate in general outline. Inflorescence pedunculate, villous, peduncles shorter than or equalling the leaves; involucre usually absent, sometimes present in the form of a few linear bracts; involucl of conspicuous linear-lanceolate bracts. Calyx teeth inconspicuous. Stylopodium lacking. Fruit ovate-oblong to globose, glabrous or pubescent, flattened dorsally; lateral and dorsal wings present; wings broadened at the base; oil-tubes large, numerous, 2-6 on the commissural side; strengthening cells absent.

Type species: **Glehnia littoralis** Schmidt, Prol. Fl. Jap. in Miq. Ann. Mus. Bot. Lugd. Bat. 3: 61. 1867; Prol. Fl. Jap. 249. 1867.



## ABBREVIATIONS

The following abbreviations have been used in citations to indicate the different herbaria from which material has been obtained for study:

M = Missouri Botanical Garden Herbarium; G = Gray Herbarium of Harvard University; NY = New York Botanical Garden Herbarium; US = United States National Herbarium; W = Herbarium of the University of Washington deposited in the Washington State Museum; O = Herbarium of the University of Oregon; OAC = Herbarium of the Oregon Agricultural College; C = Herbarium of the University of California; P = Herbarium of Pomona College.

## KEY TO THE SPECIES

Fruit pubescent, species of the eastern hemisphere.....1. *G. littoralis*  
Fruit essentially glabrous, species of the western hemisphere.....2. *G. leiocarpa*

1. *Glehnia littoralis*<sup>1</sup> Schmidt, Prol. Fl. Jap. in Miq. Ann. Mus. Bot. Lugd. Bat. 3: 61. 1867; Prol. Fl. Jap. 249. 1867.

Pl. 17, fig. 2, 3, 5; Pl. 18; Pl. 19, fig. 1.

"*Archangelica officinalis*, Hoffm.?" in Gray, "Account of the Botanical Specimens" from Narrative of the Perry Expedition 2: 312. 1856.

"*Cymopterus* (?) *littoralis*, *glaber*" Gray, "Botany of Japan," in Mem. Am. Acad. N. S. 6<sup>2</sup>: 428. 1859, *nomen nudum*.

*Cymopterus* ? *littoralis* Gray, "Botany of Japan" in Mem. Am. Acad. N. S. 6<sup>2</sup>: 391, 428. 1859, as to specimens from eastern hemisphere, *nomen nudum*.

"*Cymopteris glaber* (A. Gray)" Black, "Catalogue of Japan

<sup>1</sup> *Glehnia littoralis* Schmidt, em.—Planta humila, subacaula; foliis, petiolis excludentis, 5–13 cm. longis latisque, supra hirtellis in rachides nervosque, subtus glabris vel crebre tomentosis, ultimis segmentis foliorum oblongo-obovatis vel segmentis terminalibus cuneatis, 0.5–5 cm. longis, 0.4–4 cm. latis, apice rotundatis vel acutis, plus minusve cartilagineo-dentatis; petiolis 3–12 cm. longis, subdilatatis, hirtellis vel glabris; inflorescentiis umbellatis pedunculatis, crebre villosis; pedunculis subcrassis, subinde ramosis, foliis brevioribus vel aequantibus; umbellis patulis, 6–30-radiatis, radiis 1–3.5 cm. longis; involucri 1–3-bracteato; umbellulis capitatis, bracteis involucellorum pluribus, lanceolato-attenuatis; fructibus ovato-oblongis vel subglobosis, 0.4–1.5 cm. longis, villosis-pubescentibus, pilis multicellulatis; alis lateralibus saepe dorsalibus latioribus; vittis multis, 2–6 in commissuram.—Collected in Hakodate, Japan, 1861, *Maximowicz* (Gray Herb.), co-TYPE.



Plants" in Hodgson, "A residence at Nagasaki and Hakodate in 1859-1860," 335. 1861, *nomen nudum*; Bonplandia 10: 92. 1862, *nomen nudum*.

*Phellopterus littoralis* (Gray) Benth. in Benth. & Hook. Gen. Pl. 1: 905. 1867, as to plants of eastern hemisphere; Hance, Spic. Fl. Sin. in Jour. Bot. 16: 12. 1878; Forbes & Hemsley, Jour. Linn. Soc. Bot. 23: 331. 1888; Engl. & Prantl, Nat. Pflanzenfam. 3<sup>s</sup>: 221. 1898, as to plants of eastern hemisphere; Ito & Matsumura, Tent. Fl. Lutch. in Jour. Coll. Sci. Imp. Univ. Tokyo 12: 529. 1899; Yabe, Rev. Umb. Jap. in *Ibid.* 16<sup>2</sup>: 93. 1902; Boiss. Omb. Cor. in Bull. Herb. Boiss. II, 3: 955. 1903; Nakai, Fl. Kor. 1. in Jour. Coll. Sci. Imp. Univ. Tokyo 26<sup>1</sup>: 272. 1909; Fl. Kor. 2. in *Ibid.* 31: 492. 1911.

"*C. glaber*" Gray acc. to Schmidt, Mem. Acad. Imp. Sci. St. Petersbourg, VII, 12<sup>2</sup>: 139. 1868, *nomen nudum*.

"*Phellopterus littoralis*" acc. to Schmidt, Mem. Acad. Imp. Sci. St. Petersbourg, VII, 12<sup>2</sup>: 138. 1868.

"*Phellopterus littoralis* Schmidt" acc. to Franchet & Savatier, Enum. Plant. Jap. 1: 185. 1875; Franchet, Cat. Plantes, in Mem. Soc. Nat. Sci. Cherbourg 24: 221. 1884.

"*Glehnia littoralis* (Gray) Schmidt" acc. to Coult. & Rose, Contr. U. S. Nat. Herb. 7: 165. 1900, as to plants of eastern hemisphere.

Low subacaulescent plants; leaves, excluding petiole, 5-13 cm. long, about as broad, hirtellous on the rachises and nerves of the upper surface, glabrous to densely tomentose beneath, the ultimate leaf-segments oblong-obovate or the terminal segments cuneate, 0.5-5 cm. long, 0.4-4 cm. broad, rounded to acute at the apex, somewhat unequally cartilaginously dentate; petioles 3-12 cm. long, somewhat inflated, hirtellous to glabrous; inflorescence pedunculate, densely villous; peduncles stoutish, sometimes branched, shorter than or equalling the leaves; umbels spreading, 6-30-rayed, rays 1-3.5 cm. long; involucre 1-3-bracted; umbellets capitate, bracts of the involucre several, lance-attenuate; fruit ovate-oblong to subglobose, 0.4-1.5 cm. long, villous-pubescent with multicellular hairs, lateral wings usually broader than the dorsal wings; oil-tubes numerous, 2-6 on the commissural surface.



Type specimen: *Maximowicz*, "Glehnia littoralis F. Schmidt. Fl. Sachalin ined." Iter secundum. Japonia. Hakodate. 1861. (TYPE probably in Herb. Leningrad; co-TYPE in the Gray Herbarium of Harvard University).

Distribution: eastern hemisphere, along sandy sea-shores, from southern China northward, and in Japan.

This plant is commonly known in Japan as "*Hama-bofu*" in relation to its maritime habitat, *hama* meaning sea-coast, and *bofu*, a medicinal plant.

Specimens examined:

JAPAN: Insula Sachalin, 1860, *Schmidt* (G); Kamiiso, Prov. Oshima, Hokkaido, 12 July, 1890, *Miyabe & Tokubuchi* (G); Hakodate, Iter secundum, 1861, *Maximowicz* (G co-TYPE); Insula Jesso, circa Hakodate, 1861, *Albrecht* (G); Yezo, Ishikari, 10 Sept. 1903, *Arimoto* (G, M); Nambu, Nippon, 1865, *Maximowicz*, coll. Tschonoski (NY); Isoya, Shiribeshi, July, 1883, *Takenobu* (G); seashore, Prov. Rikuzen, 9 July, 1913, *Yasuda* (W); Isl. Futami, 24 June, 1910, Flora Japonica, collector unknown (US 1155343); Loo-Choo Islands, 1853-56, *Wright 98* (G, US); Corea, 1859, *Wilford* (NY).

SIBERIA: Vladivostok and vicinity, May-Oct. 1919, *Topping 2236* (G).

CHINA: Tsingtao, 1911, *Zimmermann* (G, US 795348); "Putoo Island—Clekiane," *Henry* (M); "Pootoo Isle, Chekiang," *Faber M<sup>6</sup>* (US); Delatache and Amoy, *Henry* (NY).

## 2. *Glehnia leiocarpa*<sup>1</sup> Mathias, nom. nov.

Pl. 17, fig. 1, 4; Pl. 19, fig. 2.

*Cymopterus* ? *littoralis* Gray, Mem. Am. Acad. N. S. 6<sup>2</sup>: 391, 428. 1859, as to American specimens, *nomen nudum*; Stevens' Rept. U. S. Expl. & Surv. from Miss. to Pacific Ocean 12<sup>2</sup>: 62. 1860; Jeps. Man. Fl. Plants Calif. 731. 1925.

*Phellopterus littoralis* (Gray) Benth. in Benth. & Hook. Gen.

<sup>1</sup> *Glehnia leiocarpa* Mathias, nom. nov.—Planta humila, subacaula; foliis, petiolis excludentis, 2.5-15 cm. longis latisque, supra hirtellis in rachides nervosque, subtus crebre tomentosis, ultimis segmentis foliorum oblongo-obovatis vel segmentis terminalibus cuneatis, 0.5-5 cm. longis, 0.4-3 cm. latis, apice rotundatis vel acutis, plus minusve dentatis, marginibus subinde cartilaginibus; petiolis 2.5-14 cm. longis, subdilatatis, hirtellis; inflorescentiis umbellatis pedunculatis, crebre villosis; pedunculis subcrassis, subinde ramosis, saepe foliis brevioribus, rare aequantibus; umbellis



Pl. 1: 905. 1867, as to American plants; Engl. & Prantl, Nat. Pflanzenfam. 3<sup>8</sup>: 221. 1898, as to American plants.

"*Glehnia littoralis* (Gray) Schmidt" acc. to Coult. & Rose, Contr. U. S. Nat. Herb. 7: 165. 1900; Piper, Contr. U. S. Nat. Herb. 11: 429. 1906; Piper & Beattie, Fl. N. W. Coast, 267. 1915; Carter & Newcombe, Prel. Cat. Fl. Vanc. 61. 1921.

"*Phellopterus littoralis* Schmidt" acc. to Wats. Bibl. Ind. 1: 430. 1878; Coult. & Rose, Rev. N. Am. Umbell. 81. 1888; Macoun, Check List Can. Plants, 25. 1889; Cat. Can. Plants 5: 329. 1890; Howell, Fl. N. W. Am. 1: 259. 1898.

*Glehnia littoralis* Schmidt acc. to Henry, Fl. S. Brit. Col. 223. 1915.

Low subacaulescent plants; leaves, excluding petiole, 2.5–15 cm. long, about as broad, hirtellous on the rachises and nerves of the upper surface, mostly densely tomentose beneath, the ultimate leaf-segments oblong-obovate or the terminal segments cuneate, 0.5–5 cm. long, 0.4–3 cm. broad, rounded to acute at the apex, unequally dentate, margins sometimes cartilaginous; petioles 2.5–14 cm. long, somewhat inflated, hirtellous; inflorescence pedunculate, densely villous; peduncles stoutish, sometimes branched, usually shorter than the leaves, rarely equalling them; umbel globose to spreading, 5–13-rayed, rays 0.5–4.5 cm. long; involucre 1–3-bracted; umbellets capitate, bracts of the involucre several, lance-attenuate; fruit ovate-oblong to subglobose, 0.4–1.2 cm. long, essentially glabrous (sometimes with a few scattered multicellular hairs), lateral wings sometimes broader than dorsal wings; oil-tubes numerous, 2–6 on commissural surface.

Type specimen: *J. G. Cooper*, "sandy shores, Washington Terr. (Shoal Water Bay)." 1854. (The type is in the Gray Herbarium of Harvard University and is labeled "*Cymopterus ? littoralis*, n. sp." in Gray's handwriting; co-types are in the Herbarium of the New York Botanical Garden and in the United States National Herbarium.)

globosis vel patulis, 5–13-radiatis, radiis 0.5–4.5 cm. longis; involucre 1–3-bracteato; umbellulis capitatis, bracteis involucellorum pluribus, lanceolato-attenuatis; fructibus ovato-oblongis vel subglobosis, 0.4–1.2 cm. longis, fere glabris vel subinde sparse pubescentibus, pilis multicellulatis; alis lateralibus dorsalibus latioribus; vittis multis, 2–6 in commissurem.—Collected on sandy shores, Shoal Water Bay, Washington Territory (State of Washington), 1854, *J. G. Cooper* (Gray Herb.), TYPE.



Distribution: North America along sandy sea-coasts from San Francisco, California northward.

Specimens examined:

ALASKA: along the Ankow River, near Ocean Cape, vicinity of Yakutat Bay, 1 July, 1892, *Funston* 51 (NY, M, C).

BRITISH COLUMBIA: vicinity of Ucleulet, Long Beach, Vancouver Island, 25 June, 1909, *Macoun* 78600 (US); sand, Oak Bay, Vancouver Island, 31 May, 1887, *Macoun* (G).

WASHINGTON: Lopez, San Juan Islands, 25 June–1 Aug. 1917, *S. M. & E. B. Zeller* 963 (NY, M, G, US); Puget Sound, *Wilkes Expedition* (NY, US 44092); Port Angeles, 26 June, 1908, *Webster* (W); sand dunes, Ocean Park, April, 1908, *Rigg* (W); Ilwaco, 21 June, 1904, *Piper* 5002 (US); Oyhut, Chehalis County, 7 June, 1897, *Lamb* 1249 (NY, M); drifting sand, common along the ocean beach, Westport, Chehalis Co., 26 June, 1892, *Henderson* 385 (US); ocean beach, Westport, Chehalis County, 26 June, 1892, *Henderson* (W); sand dunes, Westport, June, 1917, *Grant* (NY); sand spit, Sequim, June, 1915, *Grant* (NY, M 788926); Seattle, July, 1915, *Freiberg* (M 813695); sandy dunes, mouth of "Joe Creek," near Moclips, 28 June, 1908, *Foster* 824 (US); sandy sea-shores, Port Angeles, 26 June, 1908, *Flett* 3375 (US); Olympic Mts., Clallam Co., July, 1900, *Elmer* 2768 (NY, M, US); M. Beach, Westport, 10 July, 1907, *Cowles* 512 (M); "sandy shores, Washington Terr. (Shoal Water Bay)." 1854, *Cooper* (G TYPE, NY, US); beach sand, Copalis, June–July, 1902, *Conrad* 392 (US); Copalis, 30 May, 1912, *Bardell* (M 813656).

OREGON: Clatsop Beach, Clatsop Co., 21 Aug. 1902, *Sheldon* 11252 (NY, M, G, P, US); Gearhart, 19 June, 1904, *Piper* 6241 (US); Gearhart, 19 June, 1904, *Piper* 6131 (US); sandy sea-beach, Newport, 3 July, 1918, *J. Nelson* 2292 (G); Nestart's Bay, Tillamook Co., 29 June, 1894, *Lloyd* (NY); on strand, Nestucca, July–Aug. 1901, *Kirkwood* 149 (NY); sandy sea-shore, mouth of the Umpqua River, 18 June, 1885, *Howell*<sup>1</sup> (OAC, US, M, 1151); on sand dunes, mouth of Tillamook Bay, 16 July, 1882, *T. Howell* (NY); on shifting sand, Tillamook Bay, 14 July,

<sup>1</sup> Thomas Howell in the earlier period of his botanical career used the signature Thomas J. Howell which accounts for the discrepancy in names appearing on herbarium labels.



1882, *T. J. Howell* (M, US 33339); Clatsop Beach, 26 July, 1891, *J. Howell* (M 863104); on shifting sands of sea-shore, Coos Bay, 19 Aug. 1911, *House 4705* (US, NY); drifting sand, ocean beach, Tillamook Bay, 14 July, 1882, *Howell & Henderson* (O); drifting sand, ocean beach, Clatsop, 30 July, 1887, *Henderson 385* (M, OAC); beach, below Florence, 20 May, 1925, *Henderson* (O); sand of the ocean above high tide, Rockaway, 16 Sept. 1925, *Henderson* (O); sea-shore, Fort Stevens, 7 July, 1886, *Henderson* (O); Bayocean, Garibaldi, 28 Aug. 1914, *Hitchcock 12370* (US); sands of the Oregon coast between Umpqua and Coos Bay, 12 Aug. 1880, *G. Engelmann* (M); on sand dunes of the ocean, Gearhart, Clatsop County, 1 Sept. 1898, *Coville 861* (US).

CALIFORNIA: in drifting sand, Humboldt County, sand hills of ocean beach at Samoa, opp. Eureka, 7 Aug. 1901, *Tracy 1261* (C); Samoa Beach, Humboldt Co., 17 June, 1911, *Smith 3854* (NY); Trinidad, Humboldt Co., 7 June, 1911, *Smith 3806* (NY); Trinidad, Humboldt County, 6 July, 1911, *Smith 3806* (US); Pebble Beach, Crescent, Del Norte Co., 17-20 June, 1925, *Parks 8257* (C 279023); sandy dunes at Humboldt County camp, 7 miles south of Trinidad, 24 July, 1924, *A. A. Heller 13882* (NY); Crescent City, Del Norte Co., 30 June, 1899, *Davy & Blasdale 5960* (C); Point Arena, Mendocino Co., 24 July, 1900, *Davy 6050* (C); peninsula, Eureka, 23 Aug. 1904, *Congdon* (C 140694); sea-shore peninsula, Eureka, Humboldt Co., 23 July, 1904, *Congdon* (M); Humboldt Bay, May, 1901, *Chandler 1145* (C); Trinidad, Humboldt Co., 18 July, 1916, *Abrams 6140* (NY, O).

The genus *Glehnia* is characterized by its maritime habitat, broad leaf divisions, thick coriaceous texture of the leaves, and prominent wing development of the fruit. The two species are separated largely on fruit characters. *Glehnia littoralis* Schmidt, the species of the eastern hemisphere, always has a pubescent fruit. The pubescence is villous with multicellular hairs. The mature fruit may be only slightly pubescent due to the falling off of the hairs but in such cases it has a tuberculate appearance showing the previous attachment of these hairs. In the young fruit the pubescence is densely villous. As a rule the oil-tubes of the fruit are smaller and more numerous than in the other



species. The characters of inflorescence and foliage are similar in both species. There is quite a range of variation in foliage pubescence of *Glehnia littoralis*. The type of the species, the Maximowicz plant from Hakodate, represents an intermediate condition, and upon an examination of additional material may prove to be a hybrid between the glabrous and pubescent forms (pl. 18, fig. 2). The leaves are hirtellous on the lower surface and on the veins and rachises of the upper surface. The one extreme of variation in pubescence is typified by the plant collected by Wright in the Loo Choo Islands and labeled by Gray "Cymopterus littoralis ?? Gray, var. glabra, vel sp. aff." (pl. 18, fig. 1). The leaf is essentially glabrous, the hirtellous condition being limited entirely to the veins and rachises. The margins of the leaves are more frequently cartilaginous than in other forms. The other extreme of variation is typified by the plant collected by Schmidt in Sachalin in 1860 (pl. 19, fig. 1). This plant superficially more closely approaches the species of North America. The lower surface of the leaf has the same dense tomentose pubescence that occurs in *Glehnia leiocarpa*. However, an examination of a large amount of material from the eastern hemisphere shows a great number of intergrading forms; a gradual variation exists from the extreme glabrous form to the densely tomentose one. The fruit in all forms is similar, and the pubescence characters of the foliage are of no value in separating *Glehnia littoralis* into varieties or forms.

*Glehnia leiocarpa*, on the other hand, shows a very constant pubescence character. The leaves in every case are densely tomentose beneath. The fruit is glabrous with the exception of occasional multicellular hairs on the margins of the wings. In no case was a tuberculate appearance observed which would point to the previous attachment of hairs in younger conditions. The young fruit in most cases is essentially glabrous. Moreover, a cross-section of the fruit shows the oil-tubes to be larger and generally fewer in number than in *G. littoralis*.

An interesting geographical distribution is shown in connection with this genus. The two closely related species occur along the coast on both sides of the Pacific Ocean (fig. 1). *Glehnia leiocarpa* extends from Alaska to northern California and *G. littoralis* from



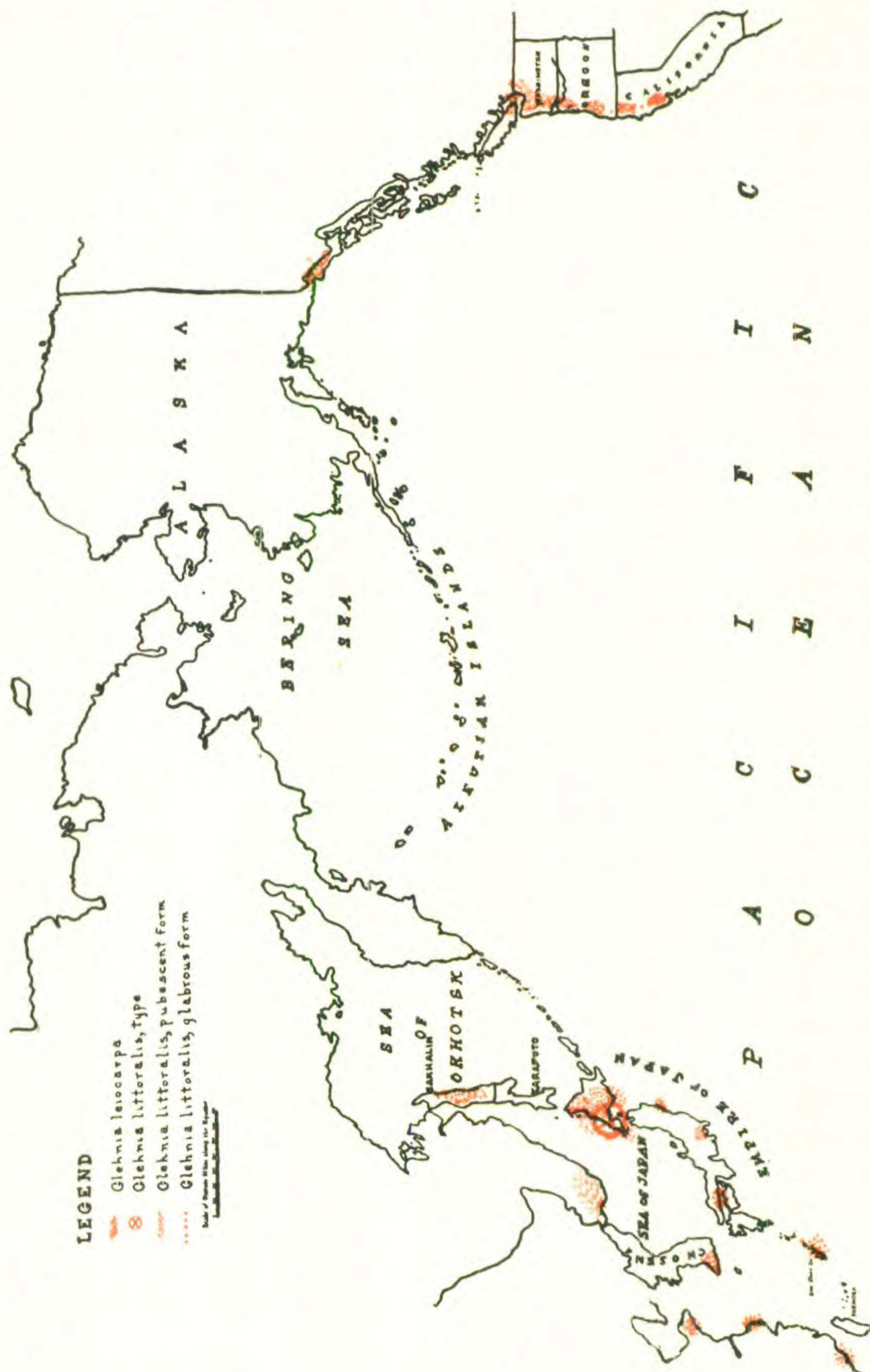


Fig. 1. Showing distrubution of species of Glehnia.



Siberia to southern China and through Japan. It is also interesting to note the distribution of the different pubescence types of *G. littoralis*. The more pubescent plants and those most nearly approaching *G. leiocarpa* occur in the northern region of the distribution area of the species, while the more glabrous plants are found in the southern range of distribution. Such a distribution seems to indicate that the ancestors of this species occurred in the intermediate area and in the land bridge connecting North America and Asia somewhere in the Bering Sea region.

A similar distribution for other genera has been pointed out by various workers in this field. One of the earliest important works was Dr. Gray's<sup>1</sup> article on the "Botany of Japan" in which he showed the similarity of the flora of northwest as well as eastern America to that of Japan. In this work he also mentions the distribution of the genus *Glehnia*. Butters,<sup>2</sup> more recently, has pointed out a similar distribution for the genus *Athyrium*. Berry<sup>3</sup> has shown this distribution for *Castanopsis*, *Pasania*, *Corylus*, *Juglans*, and other genera.

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<sup>1</sup> Gray, A. "Botany of Japan." Mem. Am. Acad. N.S. 6<sup>2</sup>: 376-449. 1859.

<sup>2</sup> Butters, F. K. Taxonomic and geographic studies in North American ferns. I. The genus *Athyrium* and the North American ferns allied to *Athyrium Filix-femina*. *Rhodora* 19: 169-207. 1917.

<sup>3</sup> Berry, E. W. Tree ancestors. 270 pp. 1923.



Garden, Dr. J. N. Rose of the United States National Herbarium, and Dr. F. A. F. C. Went of the Botanical Laboratory of Utrecht for their assistance in bibliographical details. Especial thanks are due Dr. J. M. Greenman, Curator of the Herbarium of the Missouri Botanical Garden, for his advice and assistance.

### LIST OF EXSICCATAE

The distribution numbers are printed in *italics*. The number in parenthesis is the species number used in this revision.

- |   |   |
|---|---|
| Abrams, L. <i>6140</i> (2).                 | Howell, J. — (2).                         |
| Albrecht, N. — (1).                         | Howell, T. — (2).                         |
| Arimoto, S. — (1).                          | Howell, T. J. — (2).                      |
| Bardell, E. M. — (2).                       | Kirkwood, J. E. <i>149</i> (2).           |
| Chandler, H. P. <i>1145</i> (2).            | Lamb, F. H. <i>1249</i> (2).              |
| Congdon, J. W. — (2).                       | Lloyd, F. E. — (2).                       |
| Conrad, H. S. <i>392</i> (2).               | Macoun, J. —, 78600 (2).                  |
| Cooper, J. G. — (2).                        | Maximowicz, C. J. — (1).                  |
| Coville, F. V. <i>861</i> (2).              | Maximowicz, C. J. (coll. Tschonoski) —    |
| Cowles, H. C. <i>512</i> (2).               | (1).                                      |
| Davy, J. B. <i>6050</i> (2).                | Miyabe, K. and Tokubuchi, E. — (1).       |
| Davy, J. B. and Blasdale, W. C. <i>5960</i> | Nelson, J. C. <i>2292</i> (2).            |
| (2).  | Parks, H. E. <i>8257</i> (2).             |
| Elmer, A. D. E. <i>2768</i> (2).            | Piper, C. V. <i>5002, 6131, 6241</i> (2). |
| Engelmann, G. — (2).                        | Rigg, G. B. — (2).                        |
| Faber, E. <i>M<sup>6</sup></i> (1).         | Schmidt, F. — (1).                        |
| Flett, J. B. <i>3375</i> (2).               | Sheldon, E. P. <i>11252</i> (2).          |
| Fl. Japonica (collector unknown), — (1).    | Smith, H. H. <i>3806, 3854</i> (2).       |
| Foster, A. S. <i>824</i> (2).               | Takenobu, S. — (1).                       |
| Freiberg, G. W. — (2).                      | Topping, L. <i>2236</i> (1).              |
| Funston, F. <i>51</i> (2).                  | Tracy, J. P. <i>1261</i> (2).             |
| Grant, J. M. — (2).                         | Webster, E. B. — (2).                     |
| Heller, A. A. <i>13882</i> (2).             | Wilford, C. — (1).                        |
| Henderson, L. F. — <i>385</i> (2).          | Wilkes Expedition, — (2).                 |
| Henry, A. — (1).                            | Wright, C. <i>98</i> (1).                 |
| Hitchcock, A. S. <i>12370</i> (2).          | Yasuda, A. — (1).                         |
| House, H. D. <i>4705</i> (2).               | Zeller, S. M. and E. B. <i>963</i> (2).   |
| Howell T. and Henderson, L. F. — (2).       | Zimmermann, R. — (1).                     |



## INDEX OF SPECIES

New species and combinations are printed in **bold face** type; synonyms in *italics*; and previously published names in ordinary type.

- |  |             |  |                                 |
|--|-------------|--|---------------------------------|
| " <i>Archangelica officinalis</i> Hoffm.?"         | 93          | <b>Glehnia leiocarpa</b> Mathias             |                                 |
| Athyrium   | 101         | .....  | 93, 95, 99, 101                 |
| " <i>C. glaber</i> " Gray                          | 94          | <b>Glehnia littoralis</b> Schmidt            |                                 |
| Castanopsis  | 101         | .....  | 91, 92, 93, 95, 96, 98, 99, 101 |
| Corylus  | 101         | " <i>Glehnialittoralis</i> (Gray) Schmidt"   |                                 |
| " <i>Cymopteris glaber</i> (A. Gray)"              |             | .....  | 94, 96                          |
| Black  | 93          | <b>Juglans</b>                               | 101                             |
| <b>Cymopterus</b> Raf                              | 91, 92      | <b>Pasania</b>                               | 101                             |
| <i>Cymopterus</i> sect. <i>Phellopterus</i> Nutt.  | 92          | <i>Phellopterus</i> Benth.                   | 91, 92                          |
| <i>Cymopterus?</i> <i>littoralis</i> Gray          | 91, 93, 95  | <i>Phellopterus</i> Nutt                     | 92                              |
| " <i>Cymopterus littoralis?</i> " Gray var.        |             | <i>Phellopterus littoralis</i> (Gray) Benth. |                                 |
| <i>glabra</i> "                                    | 99          | .....  | 94, 95                          |
| " <i>Cymopterus</i> (?) <i>littoralis glaber</i> " |             | " <i>Phellopterus littoralis</i> Schmidt"    | 94, 96                          |
| Gray   | 93          | " <i>Phellopterus littoralis</i> " acc. to   |                                 |
| <b>Glehnia</b> Schmidt                             | 91, 98, 101 | Schmidt                                      | 94                              |



## EXPLANATION OF PLATE

## PLATE 17

Fig. 1. Mature fruit of *Glehnia leiocarpa* Mathias, collected on "sandy shores, Washington Terr. (Shoal Water Bay)," Cooper, 1854 (Gray Herb.), TYPE.  $\times 6$ .

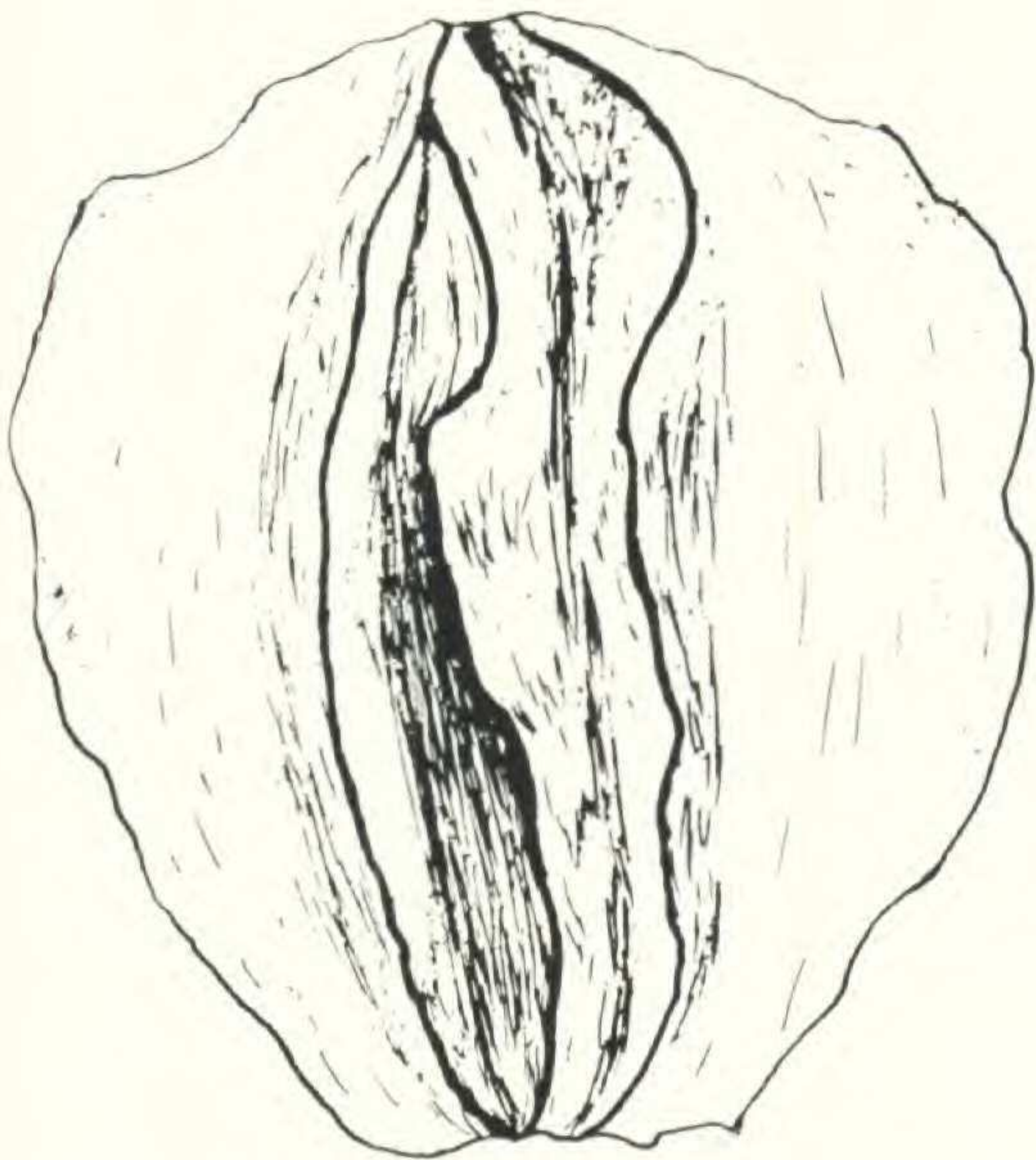
Fig. 2. Mature fruit of *Glehnia littoralis* Schmidt, collected on the Island of Sachalin, Schmidt, 1860 (Gray Herb.).  $\times 6$ .

Fig. 3. Mature fruit of *Glehnia littoralis* Schmidt, collected in Yezo, Ishikari, Arimoto, 10 Sept. 1903 (Mo. Bot. Gard. Herb.).  $\times 6$ .

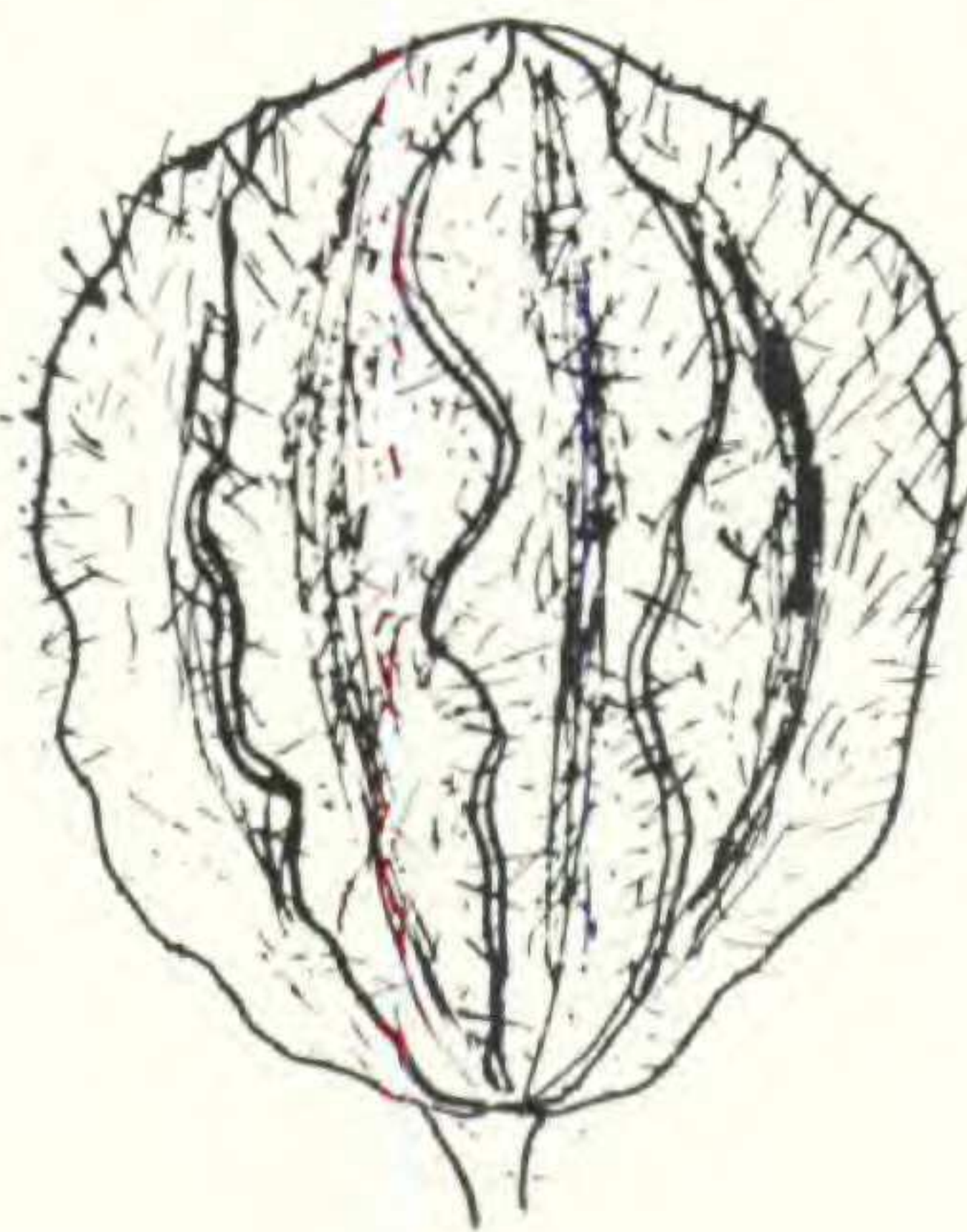
Fig. 4. Cross-section in median plane of immature fruit of *Glehnia leiocarpa* Mathias, collected on "sandy shores, Washington Terr. (Shoal Water Bay)," Cooper, 1854 (Gray Herb.), TYPE.  $\times 10$ .

Fig. 5. Cross-section in median plane of mature fruit of *Glehnia littoralis* Schmidt, collected on the Island of Sachalin, Schmidt, 1860 (Gray Herb.).  $\times 10$ .

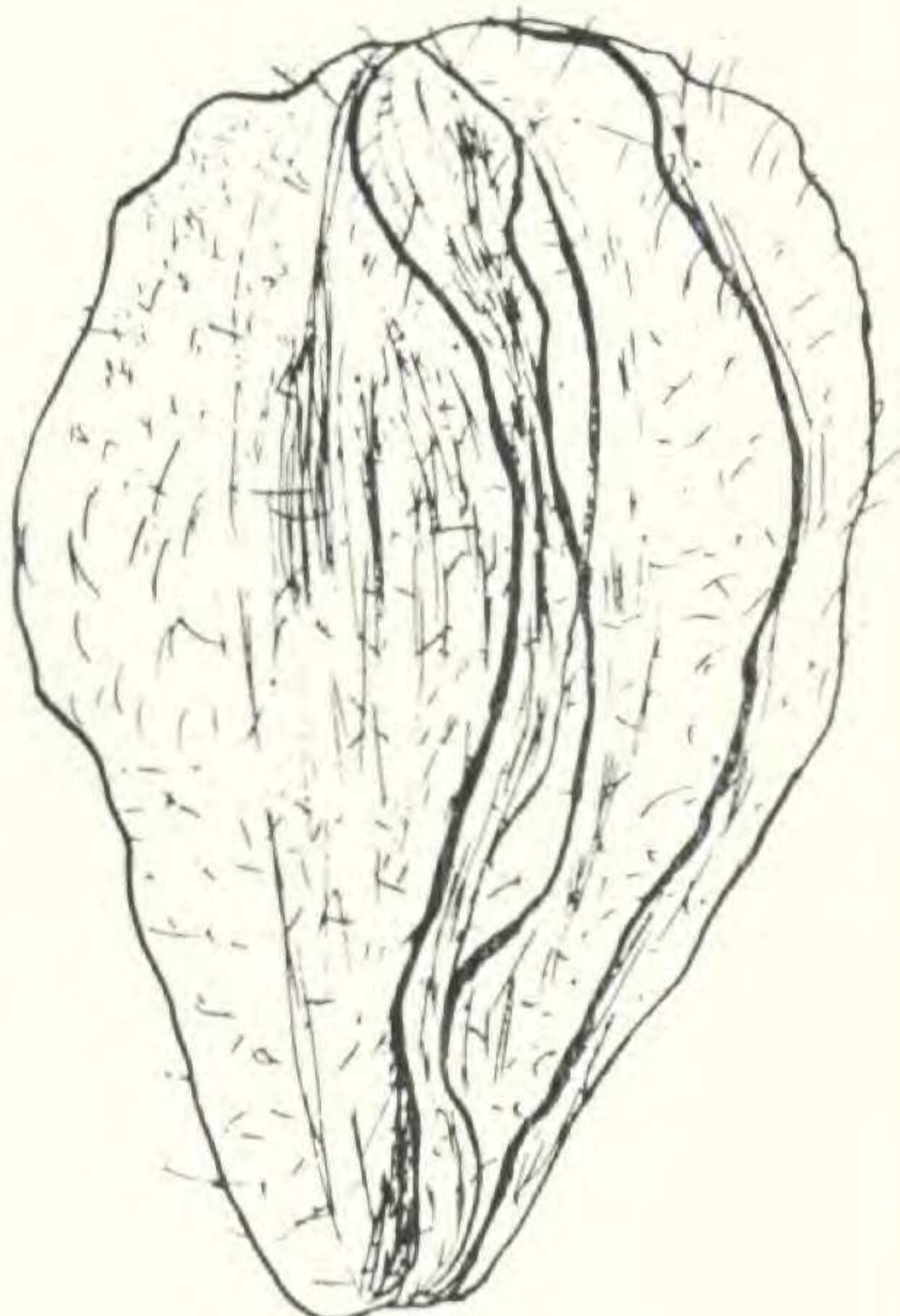




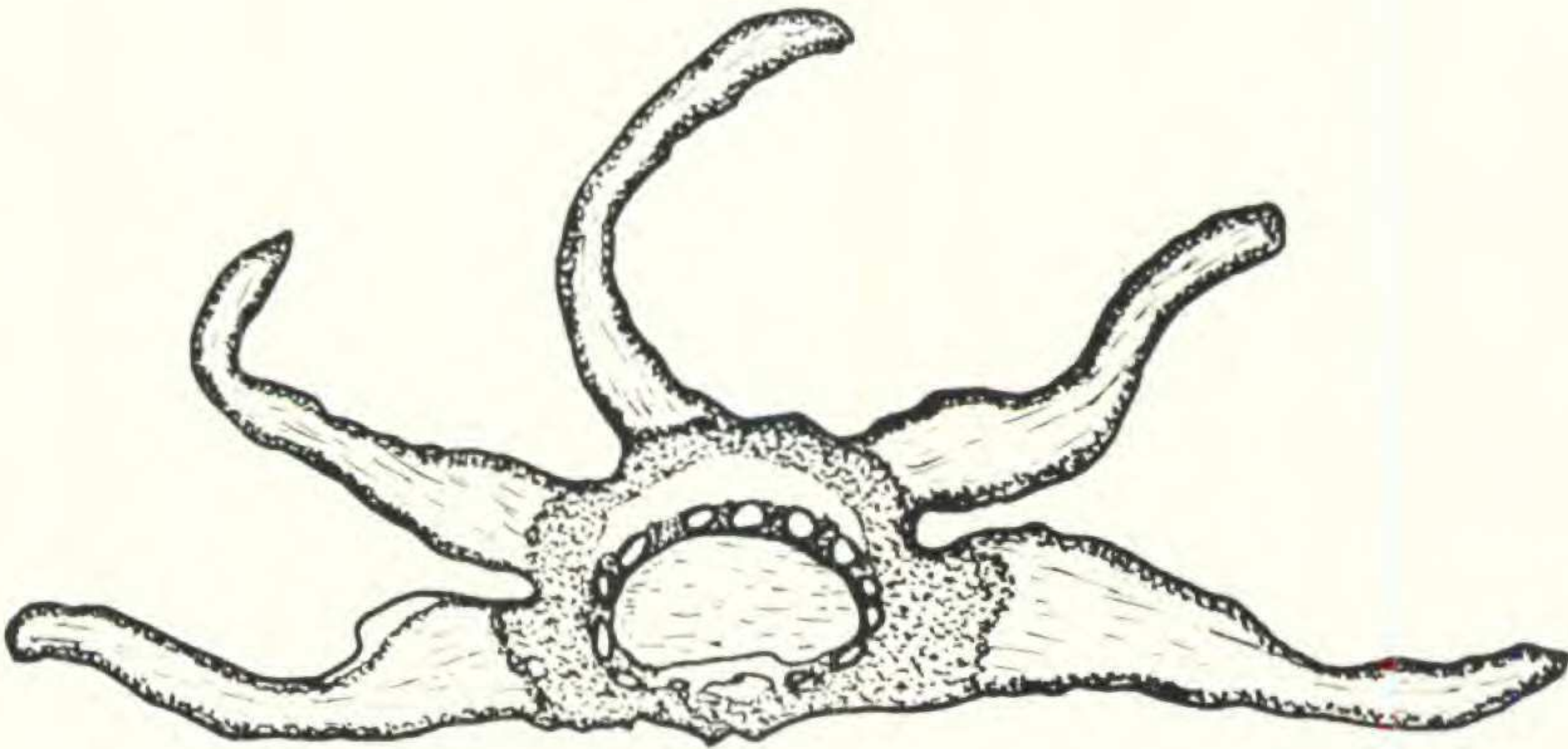
1



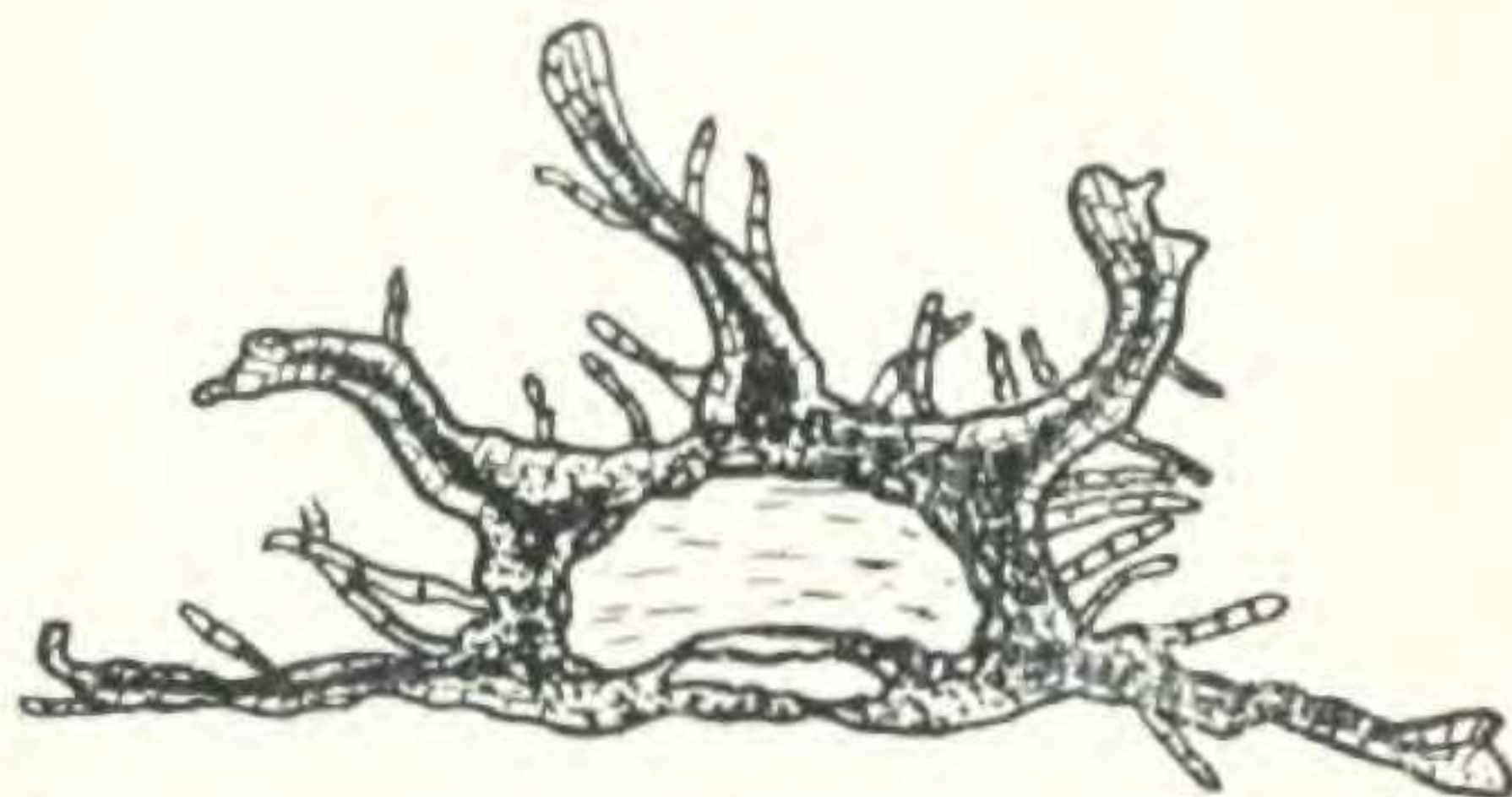
2



3



4



5



## EXPLANATION OF PLATE

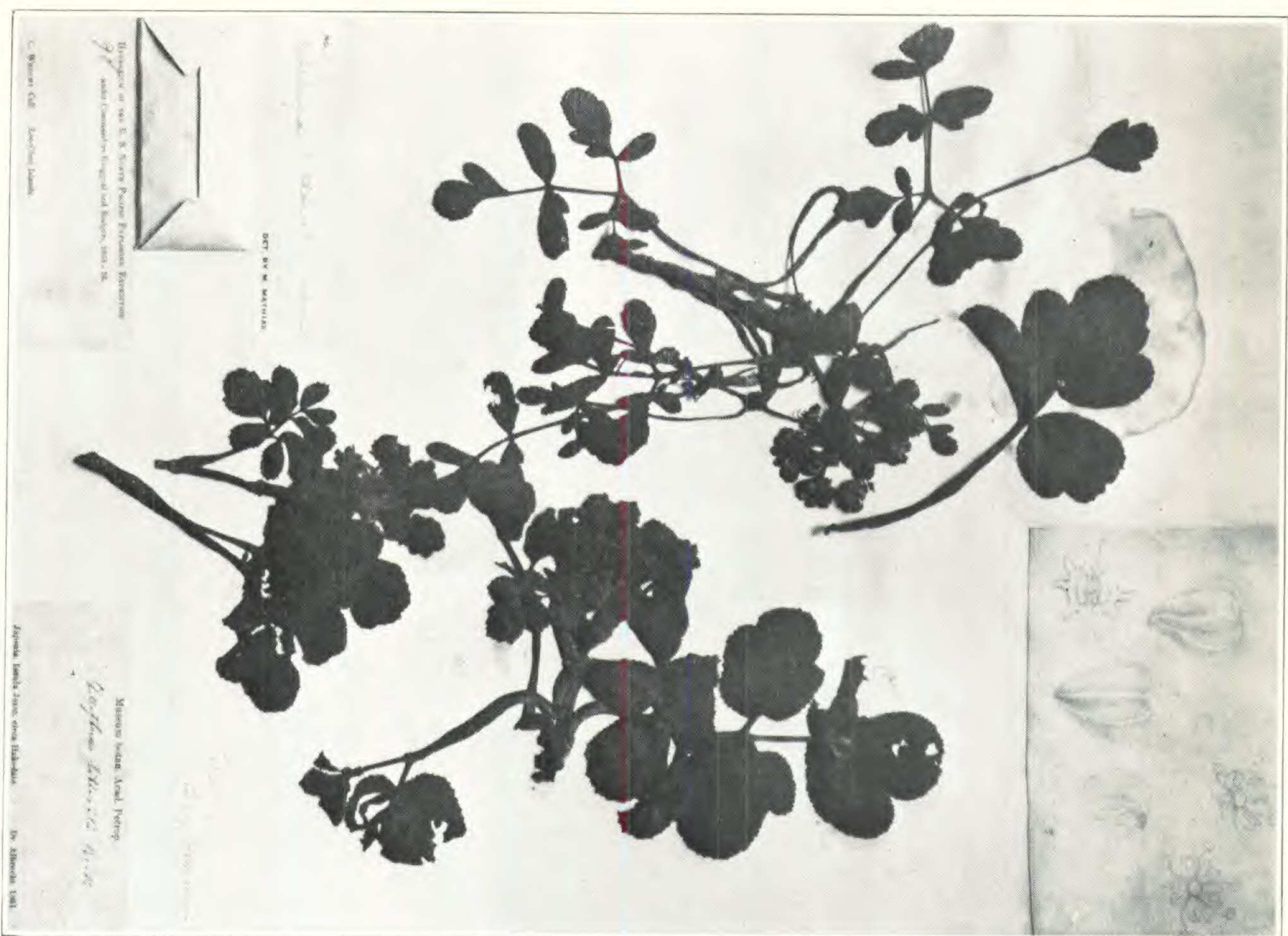
## PLATE 18

*Glehnia littoralis* Schmidt

Fig. 1. From specimens in the Gray Herbarium of Harvard University, namely *Wright* and *Albrecht*.

Fig. 2. From the co-type specimen, *Maximowicz*, in the Gray Herbarium of Harvard University.







## EXPLANATION OF PLATE

## PLATE 19

Fig. 1. *Glehnia littoralis* Schmidt, from a specimen collected by *Schmidt*, in the Gray Herbarium of Harvard University.

Fig. 2. *Glehnia leiocarpa* Mathias, from the type specimen, *Cooper*, in the Gray Herbarium of Harvard University.